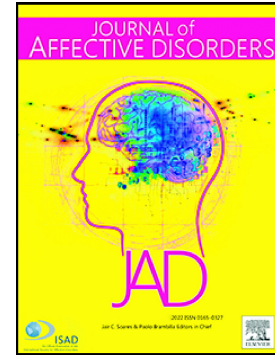


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**Exploring the Differentiated Relationship Between Body-, Eating-, and Exercise-Related
Social Comparisons and Depressive Symptoms Among Adolescents**

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Declarations of interest

The authors declare no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Exploring the Differentiated Relationship Between Body-, Eating-, and Exercise-Related Social Comparisons and Depressive Symptoms Among Adolescents

Abstract

Background: The present study examined (i) the potential differentiated relationship between three forms of social comparison previously identified as particularly relevant within the context of eating disorders (EDs) (i.e., those related to body, eating, and exercise) and depressive symptomatology among adolescents, and (ii) whether this relationship may differ according to gender and EDs risk status. *Methods:* A sample comprising 689 adolescents (46.15% females) aged 12-19 years ($M = 15.06$, $SD = 2.04$) were recruited using non-probabilistic techniques from nine schools in southern Spain. Cross-sectional data derived from a self-report survey which included the variables of interest were analysed using the PROCESS macro for SPSS. *Results:* Bootstrap mediation/moderation analysis with 5,000 resamples demonstrated two key sets of findings. Firstly, that having low self-esteem, being a girl, being at risk for ED, having social-physique anxiety, and social comparisons referring to body and exercise accounted for unique variance in depressive symptomatology. Secondly, the relationship between both eating-related and exercise-related comparisons and depressive symptomatology tended to be stronger in the group of females at risk for EDs. *Limitations:* The study was mainly limited by the use of self-reported cross-sectional data. *Conclusions:* Prevention and treatment efforts aimed at reducing depressive symptomatology among adolescents could benefit from incorporating content alluding to body comparison and, particularly in the case of females at risk for EDs, content alluding to eating and exercise comparisons.

Keywords: body image; depression; social comparison; adolescence; eating disorders

Exploring the Differentiated Relationship Between Body-, Eating-, and Exercise-Related Social Comparisons and Depressive Symptoms Among Adolescents

Social comparison (i.e., the cognitive process by which individuals compare themselves to others) (Festinger, 1954) is an important source of self-knowledge, self-evaluation, and identity construction during adolescence (van der Aar et al., 2018). However, the fact that the result of such comparisons tends to be unfavourable is considered according to the tenets of several theoretical models including the the cognitive-behavioral models of body image (Cash, 2012) and the self-worth contingency model of depression (Swallow & Kuiper, 1988), and can be a potential trigger for a number of maladaptive affective and behavioural strategies that may ultimately lead to the development of major mental health problems (Alcaraz-Ibáñez et al., 2020b; Li et al., 2021; Qian et al., 2022; Zimmer-Gembeck et al., 2021). Examples of these health issues that are particularly prevalent and highly comorbid among adolescents are eating disorders (EDs) and depressive disorders (Demmler et al., 2020; Puccio et al., 2016; Qian et al., 2022).

Research examining the relationship between social comparison and EDs has traditionally focused on physical appearance as the sole feature of comparison (Alcaraz-Ibáñez et al., 2020b, 2020a; Derohart et al., 2022; Yao et al., 2021). A more recent line of research has focused on comparisons involving behaviours (e.g., eating and exercise) that may contribute to the achievement of the goal largely underlying appearance comparisons (i.e., reaching a specific body ideal) (Fitzsimmons-Craft et al., 2012; Saunders et al., 2019). Therefore, the results of several studies conducted on females in late adolescence and early adulthood have shown that these three forms of comparison (i.e., those referring to body, eating, and exercise) contribute to explaining the symptoms of thinness-related EDs such as anorexia and bulimia nervosa both cross-sectionally and prospectively (Fitzsimmons-Craft et al., 2012; Fitzsimmons-Craft and Bardone-Cone, 2014; Thompson and Bardone-Cone, 2022).

However, the specific contribution of each of these forms of comparison to explaining depressive symptomatology among the adolescent population remains unexplored to date. Examining this issue could contribute to the identification of a group of factors potentially responsible for the high degree of comorbidity between EDs and depressive symptomatology, which would therefore constitute a priority objective in terms of prevention and treatment strategies aimed at addressing these health conditions.

There are several reasons to examine whether engaging in body, eating and exercise comparisons may similarly translate into increased depressive symptomatology across different populations in terms of gender and EDs risk status. Firstly, EDs often manifests differently among male and female individuals (Murray et al., 2017), which implies that the magnitude of the relationships between the forms of social comparison of interest and some of their potential consequences may differ between the two population groups (Paterna et al., 2023). This possibility is particularly plausible in the case of eating and exercise comparisons if consideration is given to the fact that (i) while females are more likely to modify these two behaviours in order to reduce their weight, males are more likely to do so in order to increase and define their muscles (Alcazar-Ibáñez et al., 2022; Sicilia et al., 2020); and (ii) eating and exercise are perceived as particularly effective behaviours in achieving goals pursued to a greater extent by females (particularly, those at risk or clinically diagnosed with an EDs) or males, such as weight loss and muscular gain/definition, respectively (Granero-Gallegos et al., 2018; Murray et al., 2017).

Secondly, the content of the only self-report instrument that simultaneously assesses the set of social comparisons under consideration (i.e., the Body, Eating, and Exercise Comparison Orientation Measure, BEECOM) (Fitzsimmons-Craft et al., 2012; Saunders et al., 2019) was developed taking into account experiences reported by females (and particularly those at risk or clinically diagnosed in terms of EDs). This implies that the

relevance of its content in terms of leading to the appearance of some of its potential consequences (e.g., depressive symptomatology) could be called into question both among males and those who are not at risk for EDs (Paterna et al., 2023).

In the light of these considerations, it seems worth examining the extent to which the potential positive association between engaging in body, eating, and exercise comparisons and experiencing increased depressive symptomatology may differ by gender or EDs risk status. Examination of this issue may help to identify both specific forms of comparison and specific sub-populations on which prevention efforts aimed at reducing depressive symptomatology among adolescents should be focused.

Consequently, the present study had two main objectives. These were to examine (i) the relationship between each of the three forms of social comparison proposed among adolescents as they are particularly relevant in the context of EDs (i.e., those referring to body, eating, and exercise) and depressive symptomatology, and (ii) whether this relationship may differ according to gender and EDs risk status. In addressing these two objectives, it was considered appropriate to control for some of the main potential antecedents of depressive symptomatology in the target population, such as age and gender (Shorey et al., 2022), body mass index (BMI) (Rao et al., 2020), EDs risk-status (Puccio et al., 2016), social physique anxiety (i.e., anxiety experienced as a result of anticipating negative social evaluations of one's own body) (Alcaraz-Ibáñez and Sicilia, 2020), and self-esteem (Sowislo and Orth, 2013). Based on the evidence and arguments provided by previous research (e.g., Fitzsimmons-Craft et al., 2012; Granero-Gallegos et al., 2018; Murray et al., 2017; Sicilia et al., 2020), the forms of comparison under consideration were particularly expected to contribute to explaining the variability of depressive symptomatology among female adolescents at risk for EDs.

Materials and Methods

Participants

A total of 757 potential participants in Compulsory Secondary Education, High School, Vocational Training, or University Degrees from 9 education centres in southern Spain aged between 12 and 19 years old were initially invited to participate in the study. This sample size was estimated on the basis of (i) the results of a statistical power analysis which suggested that 605 participants were necessary to detect small effect sizes (i.e., $f^2 = 0.03$) with a statistical power level of 80% ($p < .05$) (Faul et al., 2009); and (ii) the eventual non-compliance of some of the potential participants with the inclusion criteria for data collection. These criteria were being (i) aged between 12-19 years; and (ii) able to provide informed consent to participate in the research, which had to be additionally provided by the parents or legal guardians of the minors (i.e., those aged 17 years and below). Failure to meet the above inclusion criteria meant that data were not obtained from 47 of the initially invited participants. Non-binary identification in terms of gender or providing a wrong answer to the attention check item (i.e., “*This is an attention control query, please mark the answer option labelled as 1*”) led to the exclusion of data from 5 and 16 participants, respectively, from the analyses. Therefore, data from a total of 689 participants were analysed (46.15% females; $M_{\text{age}} = 15.06$ years; $SD_{\text{age}} = 2.04$).

Instruments

EDs risk status

The Spanish version (Garcia-Campayo et al., 2005) of the SCOFF screening tool (Morgan et al., 1999) was used to assess for EDs risk status. This instrument includes five binary choice items (i.e., yes/no) that cover the main components of anorexia and bulimia nervosa (e.g., “*Would you say food dominates your life?*”). Two or more positive responses is deemed indicative of a high risk of suffering from thinness-related EDs (Morgan et al., 1999).

Sensitivity values of 80% and specificity values of 93% have been reported for the SCOFF in the Spanish context (Botella et al., 2013). This instrument has previously been used for screening purposes in adolescents from Spain (Alcaraz-Ibáñez, 2017; Veses et al., 2014).

Self-esteem

A translation into Spanish (i.e., “*Tengo una alta autoestima*”) of the single-item originally proposed in English (i.e., “*I have high self-esteem*”) (Robins et al., 2001) was used to assess self-esteem. This item is answered on a scale from 1 (*Not very true of me*) to 7 (*Very true of me*). Evidence that supports the psychometric properties of such an instrument (particularly with regard to its high degree of convergence with longer instruments) has been previously reported, also in adolescents (Robins et al., 2001; Rodgers et al., 2020). Higher scores reflect higher levels of self-esteem.

Social physique anxiety

The version of the *Social Physique Anxiety Scale* (SPAS; Motl and Conroy, 2000) validated among Spanish adolescents (Cáñez-Alvarez et al., 2013) was used to assess social physique anxiety. The SPAS comprises seven items (e.g., “*I wish I wasn't so up-tight about my physique or figure*”) that are answered on a scale from 1 (*Never*) to 5 (*Always*). Higher scores reflect higher levels of social physique anxiety. Values of internal consistency (α) \geq .85 and composite reliability (ρ) \geq .92 were found in the present sample (see Table 1).

Body, eating, and exercise social comparison

The version of the *Body, Eating, and Exercise Comparison Orientation Measure-Short* (BEECOM-S) (Saunders et al., 2019) validated for Spanish adolescents (Paterna et al., 2023) was used to assess the three types of comparison. The instrument comprises nine items evenly distributed across three factors: (i) body comparison (e.g., “*I compare my body shape to that of my peers*”); (ii) eating comparison (e.g., “*During meals, I compare what I am eating to what others are eating*”); and (iii) exercise comparison (e.g., “*I pay close attention when I*

hear peers talking about exercise in order to determine if I am exercising as much as they are”). The items are answered on a scale from 1 (*Never*) to 7 (*Always*). Higher scores reflect higher frequency of comparison. Values of α and $\rho \geq .82$ were found for the different factors of the BEECOM-S in the present study (see Table 1).

Depressive symptomatology

The version previously used in the Spanish context (Alcaraz-Ibáñez and Sicilia, 2020; Andreu et al., 2008) of the depression subscale of the *Brief Symptom Inventory-18* (Derogatis, 2000) was used to assess depressive symptoms. The BSI-18 comprises six items (e.g., “*Feeling hopeless about the future*”) which assess the level of distress caused by depressive symptoms (i.e., apathy, sadness, self-deprecation, anhedonia, loss of hope, and suicidal ideation) during the past two weeks (American Psychiatric Association, 2013). The items are answered on a scale from 0 (*Not at all*) to 4 (*Extremely*). Higher scores reflect higher levels of depressive symptoms. Values $\geq .87$ both for α and ρ were found in the present study (see Table 1).

Socio-demographic variables

In relation to socio-demographics, participants were asked to report their gender (i.e., male, female, other), age, height, and weight. The latter two values were used to compute BMI, which was adjusted according to the percentile distribution (P-BMI) taking into account the sex and age norms available for the Spanish population (Fernández et al., 2011).

Procedure

First, approval was obtained from the ethics committee of the authors’ affiliation institution. Potential participants were invited to join the study in the classroom setting by one of the research team, who informed about the voluntary and anonymous nature of the study participation, as well as the right to leave the study at any time. Participants who met the

inclusion criteria completed a questionnaire in paper format, which took approximately 5-10 minutes.

Statistical Analyses

Preliminary analyses

The data were first screened for missing values and outliers ($|z| > 4.00$, $p < .001$) (Hair et al., 2010). Next, internal consistency (α) and composite reliability (ρ) values were obtained for the scores derived from the multi-item instruments. The second of these values was derived from the results of a confirmatory factor analysis (CFA) that, by employing the Maximum Likelihood with Robust standard errors estimation method (MLR), was conducted in Mplus 7 (Muthén and Muthén, 2017). Next, descriptive statistics and bivariate correlations between the study variables were obtained. Finally, the effect sizes of differences (d) in the study variables across gender and EDs risk status groups were computed. In this analysis the pooled standard deviation was obtained by weighting the specific sample size of the comparison groups. The effect sizes were interpreted as trivial ($d = 0.00$ to 0.20), small ($d = 0.20$ to 0.50), intermediate ($d = 0.50$ to 0.80), and large ($d > 0.80$) (Cohen, 1988).

Main analyses

The multivariate relationships of interest were first examined by a linear regression analysis conducted in SPSS v. 25 using a bias-corrected and accelerated bootstrap technique with 5,000 resamples. This technique does not require the fulfilment of assumptions such as homoscedasticity or residual normality (Hayes, 2013). Next, the possibility that the magnitude of the relationship between the three forms of comparison considered and depressive symptomatology may differ depending on (i) risk status in terms of EDs or gender (two-way interactions), and (ii) both variables simultaneously (three-way interaction), were respectively examined using Models 1 and 3 of the PROCESS macro for SPSS (Hayes, 2013). The relationships under examination are considered statistically significant when the 95%

confidence interval (CI) derived from applying a bias-corrected and accelerated bootstrap technique with 5,000 resamples do not contain zero. Age, gender, P-BMI, self-esteem, and EDs risk status were entered as covariates in the main analyses described above. Given the high number of independent variables involved (up to 13 in the more complex regression models), the Benjamini-Hochberg procedure with a false discovery rate of 0.05 was used to correct for multiple comparisons (Benjamini and Hochberg, 1995).

Results

Preliminary Analyses

The results of Little's MCAR test ($\chi^2 = 46.795$, $df = 54$, $p = .746$) suggested the completely random nature of the missing data. These (< 0.02 %) were consequently imputed using the expectation maximisation algorithm (Schlomer et al., 2010). No outliers were identified. Low correlation levels (i.e., r between .015 and .081) were observed between the only reverse-worded item of the SPAS (i.e., item 7) and the remaining items from the instrument. Given the agreement of this finding with earlier studies (Alcaraz-Ibáñez and Sicilia, 2020), so that this item was excluded from the calculation of the SPAS scores. The descriptive statistics and the differences across gender and EDs risk groups are shown in Table 1. With the exception of self-esteem scores, all other scores were below the midpoint of the scales. Small size differences favouring females were observed for social physique anxiety, body comparison, and depressive symptomatology. These differences were also small but favoured boys in the case of P-BMI and self-esteem. Differences favouring the group of participants at risk for EDs were observed, which were (i) small for P-BMI, and (ii) large for social physique anxiety, the three forms of social comparison under examination, and depressive symptomatology. The bivariate correlations between the study variables are shown in Table 2. The magnitude of the correlations between depressive symptomatology and

the remaining study variables ranged from small to moderate. A total of 26.73% of the females and 21.56% of the males were at risk for EDs.

Main Analyses

The variance inflation and tolerance values were below 3 and above .33 respectively, which did not suggest multicollinearity (Kline, 2011). The results of the regression analysis (see Table 3) showed that self-esteem (negatively) and being a girl, being at risk for ED, social physique anxiety, and social comparisons referring to body and exercise (positively) accounted for unique variance in depressive symptomatology ($F(9, 579) = 32.653, p < .001, R^2 = .302$). From the six models testing the potential two-way interactions, only the one involving exercise comparison and risk for EDs contributed to explaining additional variance in depressive symptomatology ($\beta = .194; B = .121, IC95\% = .009 \text{ a } .234; \Delta R^2 = .007, p = .035$). In this model, the parameter corresponding to the two-way interaction was found to be statistically significant after applying the Benjamini-Hochberg correction for multiple tests. From the three models testing the potential three-way interactions, the ones involving the interactions between (i) eating comparison, gender, and risk for EDs ($\beta = -.375; B = -.244, IC95\% = -.469 \text{ a } -.019; \Delta R^2 = .007, p = .033$), and (ii) exercise comparison, gender, and risk for EDs ($\beta = -.414; B = -.253, IC95\% = -.481 \text{ a } -.035; \Delta R^2 = .008, p = .023$) contributed to explaining additional variance in depressive symptomatology. In these two latter models, the parameters corresponding to the three-way interactions were found to be statistically significant after applying the Benjamini-Hochberg correction for multiple tests. The results of the conditional analyses (see Table 4 and Figure 1) showed that the positive relationships between comparisons concerning both eating and exercise and depressive symptomatology were significantly higher in the group of females at risk for EDs.

Discussion

The main aim of the present study was to examine whether engaging in social comparison focused on the body, eating, and exercise explained the variability in depressive symptomatology in a mixed gender sample of Spanish adolescents. The results concur with those reported by previous studies in pointing out the potential detrimental role of social comparison in terms of its likely influence on the occurrence of depressive symptomatology among adolescents (Li et al., 2021; Zimmer-Gembeck et al., 2021). The main novelty of the present study is the evidence supporting the possibility presented above for three types of comparisons hitherto unexplored in this context. The evidence provided in the present study extends to a health-relevant outcome such as depressive symptomatology the potential role previously conferred to comparisons focused on body, eating, and exercise in terms of their likely influence on the onset and maintenance of EDs (Fitzsimmons-Craft et al., 2012; Fitzsimmons-Craft and Bardone-Cone, 2014; Paterna et al., 2023; Saunders et al., 2019). Taken together, these findings support the possibility that the cognitive process inherent in the social comparison of both body and eating/exercise habits may be in part responsible for the high degree of comorbidity between EDs and depressive symptomatology.

A particularly important finding of the present study was that the explanatory capability of social comparisons focused on body, eating, and exercise to explain depressive symptomatology may differ across populations. Therefore, while the body comparisons tended to explain depressive symptomatology to a similar extent among adolescents of either gender or of different EDs risk status, the eating and exercise comparison only did so among females at risk for EDs. This suggests that, although the instrument currently available (and used here) to assess such comparisons was developed with a focus on experiences reported by females mostly at risk or clinically diagnosed with EDs (Fitzsimmons-Craft et al., 2012), the body comparison content included in the instrument appears to be relevant in terms of its

potential ability to explain depressive symptomatology among males and among individuals not at risk for EDs. This seems plausible if it is considered that the specific characteristics for comparison included in the instrument do not capture some of those identified as particularly salient for males (e.g., body shape in terms of muscle definition) or females (e.g., weight) (Murray et al., 2017) but others that, using somewhat generic body-related terms (e.g., “my body”, “specific parts of my body”, and “shape of my body” (Fitzsimmons-Craft et al., 2012; Paterna et al., 2023), could be relevant to individuals of either gender.

The fact that eating and exercise comparisons contributed significantly in explaining depressive symptomatology only among girls at risk for EDs suggests that these two forms of comparison are particularly relevant among this population group. These findings are consistent with the fact that the behaviours being compared are particularly valued by females clinically diagnosed or at risk for EDs because of their potential to promote body weight reduction (Fitzsimmons-Craft et al., 2012; Saunders et al., 2019). With regard to the comparisons referring to eating and exercise, it should be noted that the instrument used in the present study does not incorporate content alluding to behaviours that may contribute to modifying body features that are expected to be of relevance for much of the male population. Clear examples of this are consuming dietary supplements such as protein powders or practicing exercise modalities focused on muscle gain and muscle definition (Granero-Gallegos et al., 2018; Murray et al., 2017; Sicilia et al., 2020). This circumstance does not rule out the possibility that the comparison of other characteristics of eating and exercise patterns not included in the instrument used here (Saunders et al., 2019) may also account for the presence of depressive symptomatology among the male population.

In light of this, future research efforts should be made to describe the precise nature of the body-related, eating-related, and exercise-related social comparisons among the male population. Such efforts could lay the groundwork for the subsequent design of instruments

that would allow for a more comprehensive assessment of social comparisons particularly present in the context of EDs. In addition, it seems appropriate to draw attention to a number of aspects which, in spite of being (i) potentially present in social comparison processes and (ii) differentially related at the theoretical level with their possible consequences have not been yet examined in the case of eating and exercise habits. This mainly refers to the fact that comparisons are likely to be made with individuals who are perceived as advantaged (upward comparison) or disadvantaged (downward comparison) in terms of the specific attribute of comparison (Swallow and Kuiper, 1988).

The findings from the present study should be interpreted in relation to a number of limitations. First, the cross-sectional nature of the data being analysed makes it impossible to establish the causality of the relationships under consideration. A second important limitation stems from the nature of some of the instruments used. For example, the risk for EDs and depression symptoms were assessed using brief self-report instruments (Derogatis, 2000; Morgan et al., 1999). However, the symptoms involved in these two pathologies are complex. For example, such symptoms could extend beyond those mainly related to thinness included in the instrument used in the present study to assess the risk for EDs (Morgan et al., 1999). It is also possible that using a single item in the assessment of self-esteem could have compromised the comprehensiveness of the construct (Diamantopoulos et al., 2012). Additionally, the use of self-reported values for height and weight may have resulted in an underestimation of the BMI value (Galfo et al., 2018). Finally, it is worth noting that other forms of comparison potentially related to depressive symptomatology among adolescents (e.g., academic performance) (Li et al., 2021) were not assessed. In view of these limitations, future research should corroborate the findings of the present study by employing multiple measures over time, more complex assessment measures (e.g., clinical interviews in the case of EDs and depressive symptomatology, more psychometrically robust instruments in the case

of self-esteem, or direct objective measures of height and weight) and additional forms of comparison.

Conclusion

In sum, the results of the present study suggest that prevention efforts aimed at reducing depressive symptomatology among the adolescent population may benefit from incorporating content alluding to body comparison and, in the particular case of females at risk for thinness-related EDs, content alluding to the comparison of eating and exercise habits.

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References

- Alcaraz-Ibáñez, M., 2017. Social appearance comparison in exercise contexts as a predictor of eating disorder symptoms in male and female adolescents. *Espiral Cuad. del Profr.* 10, 80–89. <https://doi.org/10.25115/ecp.v10i21.1031>
- Alcaraz-Ibáñez, M., Paterna, A., Griffiths, M.D., Demetrovics, Z., Sicilia, A., 2022. Gender-related differences in self-reported problematic exercise symptoms: A systematic review and meta-analysis. *Psychol. Sport Exerc.* 63, 102280. <https://doi.org/10.1016/j.psychsport.2022.102280>
- Alcaraz-Ibáñez, M., Paterna, A., Griffiths, M.D., Sicilia, A., 2020a. Examining the role of social physique anxiety on the relationship between physical appearance comparisons and disordered eating symptoms among Spanish emerging adults. *Scand. J. Psychol.* 61, 803–808. <https://doi.org/10.1111/sjop.12662>
- Alcaraz-Ibáñez, M., Sicilia, A., 2020. Analysis of the dynamic relationship between social physique anxiety and depressive symptoms in young adults. *J. Appl. Dev. Psychol.* 66, 101085. <https://doi.org/10.1016/j.appdev.2019.101085>
- Alcaraz-Ibáñez, M., Sicilia, A., Díez-Fernández, D.M., Paterna, A., 2020b. Physical appearance comparisons and symptoms of disordered eating: The mediating role of social physique anxiety in Spanish adolescents. *Body Image* 32, 145–149. <https://doi.org/10.1016/j.bodyim.2019.12.005>
- American Psychiatric Association, 2013. *Diagnostic and statistical manual of mental disorders*. American Psychiatric Association, Arlington, VA.
- Andreu, Y., Galdón, M.J., Durá, E., Ferrando, M., Murgui, S., García, A., Ibáñez, E., 2008. Psychometric properties of the Brief Symptom Inventory-18 (BSI-18) in a Spanish sample of outpatients with psychiatric disorders. *Psicothema* 20, 844–850.
- Barnhart, W.R., Sun, H., Lin, Z., Lu, C., Han, X., He, J., 2022. Integrating the tripartite

- influence, minority stress, and social comparison theories to explain body image and disordered eating in Chinese sexual minority men and women. *Body Image* 43, 95–106.
<https://doi.org/10.1016/j.bodyim.2022.08.012>
- Benjamini, Y., Hochberg, Y., 1995. Controlling the false discovery rate: A practical and powerful approach to multiple testing. *J. R. Stat. Soc. Ser. B.* 57, 289–300.
<https://doi.org/10.1111/j.2517-6161.1995.tb02031.x>
- Botella, J., Sepúlveda, A.R., Huang, H., Gambará, H., 2013. A meta-analysis of the diagnostic accuracy of the SCOFF. *Span. J. Psychol.* 16, 1–8. <https://doi.org/10.1017/sjp.2013.92>
- Cash, T.F., 2012. Cognitive-behavioral perspectives on body image, in: Cash, T.F. (Ed.), *Encyclopedia of body image and human appearance*. Academic Press, San Diego, CA, pp. 334–342. <https://doi.org/10.1016/B978-0-12-384925-0.00054-7>
- Cohen, J., 1988. *Statistical power analysis for the behavioral sciences*, 2nd ed. Lawrence Erlbaum, Hillsdale, NJ.
- Demmler, J.C., Brophy, S.T., Marchant, A., John, A., Tan, J.O.A., 2020. Shining the light on eating disorders, incidence, prognosis and profiling of patients in primary and secondary care: National data linkage study. *Br. J. Psychiatry* 216, 105–112.
<https://doi.org/10.1192/bjp.2019.153>
- Derogatis, L.R., 2000. *Brief Symptom Inventory 18*. NCS Pearson, Inc., Minneapolis, MN.
- Diamantopoulos, A., Sarstedt, M., Fuchs, C., Wilczynski, P., Kaiser, S., 2012. Guidelines for choosing between multi-item and single-item scales for construct measurement: A predictive validity perspective. *J. Acad. Mark. Sci.* 40, 434–449.
<https://doi.org/10.1007/s11747-011-0300-3>
- Faul, F., Erdfelder, E., Buchner, A., Lang, A.G., 2009. Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behav. Res. Methods* 41, 1149–1160.

- Fernández, C., Lorenzo, H., Vrotsou, K., Aresti, U., Rica, I., Sánchez, E., 2011. Curvas y tablas de crecimiento (Estudios longitudinal y transversal). Fundación Faustino Orbegozo Eizaguirre, Bilbao, España.
- Festinger, L., 1954. A theory of social comparison processes. *Hum. Relations* 7, 117–140.
- Fitzsimmons-Craft, E.E., Bardone-Cone, A.M., 2014. One-year temporal stability and predictive and incremental validity of the body, eating, and exercise comparison orientation measure (BEECOM) among college women. *Body Image* 11, 27–35. <https://doi.org/10.1016/j.bodyim.2013.09.003>
- Fitzsimmons-Craft, E.E., Bardone-Cone, A.M., Harney, M.B., 2012. Development and validation of the Body, Eating, and Exercise Comparison Orientation Measure (BEECOM) among college women. *Body Image* 9, 476–487. <https://doi.org/10.1016/j.bodyim.2012.07.007>
- Galfo, M., Censi, L., D'Addezio, L., Mastorci, D., Roccaldo, R., 2018. Validity of self-reported weight, height and BMI in Italian adolescents for assessing prevalence of overweight/obesity. *Clin. Nutr. Metab.* 5, 1–7. <https://doi.org/10.15761/cnm.1000101>
- García-Campayo, J., Sanz-Carrillo, C., Ibañez, J.A., Lou, S., Solano, V., Alda, M., 2005. Validation of the Spanish version of the SCOFF questionnaire for the screening of eating disorders in primary care. *J. Psychosom. Res.* 59, 51–55. <https://doi.org/10.1016/j.jpsychores.2004.06.005>
- Granero-Gallegos, A., Martín-Albo, J., Sicilia, A., Medina-Casaubón, J., Alcaraz-Ibáñez, M., 2018. Analysis of sociocultural stereotypes towards thin body and muscular body: Differences according to sex and weight discrepancy. *J. Psychodidactics* 23, 26–32. <https://doi.org/10.1387/RevPsicodidact.17182>
- Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E., 2010. *Multivariate data analysis: A global perspective*, 7th ed. Prentice-Hall, Upper Saddle River, NJ.

- Hayes, A.F., 2013. Introduction to mediation, moderation, and conditional process analysis: A regression-based approach. Guilford Press, New York.
- Kline, R.B., 2011. Principles and practice of structural equation modeling, 3th ed. Guilford Press, New York.
- Li, J., Zhang, N., Yao, M., Xing, H., Liu, H., 2021. Academic social comparison and depression in Chinese adolescents: The mediating role of basic psychological needs satisfaction. *School Ment. Health* 13, 719–729. <https://doi.org/10.1007/s12310-021-09436-8>
- Morgan, J.F., Reid, F., Lacey, J.H., 1999. The SCOFF questionnaire: Assessment of a new screening tool for eating disorders. *BMJ* 319, 1467–1468. <https://doi.org/10.1136/bmj.319.7223.1467>
- Motl, R.W., Conroy, D.E., 2000. Validity and factorial invariance of the Social Physique Anxiety Scale. *Med. Sci. Sport. Exerc.* 32, 1007–1017. <https://doi.org/10.1097/00005768-200005000-00020>
- Murray, S.B., Nagata, J.M., Griffiths, S., Calzo, J.P., Brown, T.A., Mitchison, D., Blashill, A.J., Mond, J.M., 2017. The enigma of male eating disorders: A critical review and synthesis. *Clin. Psychol. Rev.* 57, 1–11. <https://doi.org/10.1016/j.cpr.2017.08.001>
- Muthén, L.K., Muthén, B.O., 2017. Mplus user's guide, 8th ed. Muthén & Muthén, Los Angeles, CA.
- Paterna, A., Alcaraz-Ibáñez, M., Sicilia, A., 2023. Psychometric examination of the Body, Eating, and Exercise Comparison Orientation Measure (BEECOM) among Spanish adolescents and young adults. *Nutrients* 15, 626. <https://doi.org/10.3390/nu15030626>
- Puccio, F., Fuller-Tyszkiewicz, M., Ong, D., Krug, I., 2016. A systematic review and meta-analysis on the longitudinal relationship between eating pathology and depression. *Int. J. Eat. Disord.* 49, 439–454. <https://doi.org/10.1002/eat.22506>

- Qian, J., Wu, Y., Liu, F., Zhu, Y., Jin, H., Zhang, H., Wan, Y., Li, C., Yu, D., 2022. An update on the prevalence of eating disorders in the general population: a systematic review and meta-analysis. *Eat. Weight Disord.* 27, 415–428. <https://doi.org/10.1007/s40519-021-01162-z>
- Rao, W.W., Zong, Q.Q., Zhang, J.W., An, F.R., Jackson, T., Ungvari, G.S., Xiang, Y., Su, Y.Y., D'Arcy, C., Xiang, Y.T., 2020. Obesity increases the risk of depression in children and adolescents: Results from a systematic review and meta-analysis. *J. Affect. Disord.* 267, 78–85. <https://doi.org/10.1016/j.jad.2020.01.154>
- Robins, R.W., Hendin, H.M., Trzesniewski, K.H., 2001. Measuring global self-esteem: Construct validation of a single-item measure and the Rosenberg Self-Esteem Scale. *Personal. Soc. Psychol. Bull.* 27, 151–161. <https://doi.org/10.1177/0146167201272002>
- Rodgers, R.F., Slater, A., Gordon, C.S., McLernon, S.A., Jarman, H.K., Paxton, S.J., 2020. A biopsychosocial model of social media use and body image concerns, disordered eating, and muscle-building behaviors among adolescent girls and boys. *J. Youth Adolesc.* 49, 399–409. <https://doi.org/10.1007/s10964-019-01190-0>
- Sáenz-Alvarez, P., Sicilia, A., González-Cutre, D., Ferriz, R., 2013. Psychometric properties of the Social Physique Anxiety Scale (SPAS-7) in Spanish adolescents. *Span. J. Psychol.* 16, 1–9. <https://doi.org/10.1017/sjp.2013.86>
- Saunders, J.F., Eaton, A.A., Fitzsimmons-Craft, E.E., 2019. Body-, eating-, and exercise-related comparisons during eating disorder recovery and validation of the BEECOM-R. *Psychol. Women Q.* 43, 494–508. <https://doi.org/10.1177/0361684319851718>
- Schlomer, G.L., Bauman, S., Card, N.A., 2010. Best practices for missing data management in counseling psychology. *J. Couns. Psychol.* 57, 1–10. <https://doi.org/10.1037/a0018082>
- Shorey, S., Ng, E.D., Wong, C.H., 2022. Global prevalence of depression and elevated depressive symptoms among adolescents: A systematic review and meta-analysis. *Br. J.*

- Clin. Psychol. 61, 287–305. <https://doi.org/10.1111/bjc.12333>
- Sicilia, A., Fuller-Tyszkiewicz, M., Rodgers, R.F., Granero-Gallegos, A., Lo Coco, G., Dion, J., McCabe, M., Strodl, E., Markey, C.H., Aimé, A., Gullo, S., Mellor, D., Castelnuovo, G., Probst, M., Mañano, C., Manzoni, G.M., Begir, C., Blackburn, M.-E., Pietrabissa, G., Hayami-Chisuwa, N., He, Q., Caltabiano, M., Alcaraz-Ibáñez, M., 2020. Cross-country measurement invariance and effects of sociodemographic factors on body weight and shape concern-related constructs in eight countries. *Body Image* 35, 288–299. <https://doi.org/10.1016/j.bodyim.2020.09.015>
- Sowislo, J.F., Orth, U., 2013. Does low self-esteem predict depression and anxiety? A meta-analysis of longitudinal studies. *Psychol. Bull.* 139, 213–240. <https://doi.org/10.1037/a0028931>
- Swallow, S.R., Kuiper, N.A., 1988. Social comparison and negative self-evaluations: An application to depression. *Clin. Psychol. Rev.* 8, 55–76. [https://doi.org/10.1016/0272-7358\(88\)90049-9](https://doi.org/10.1016/0272-7358(88)90049-9)
- Thompson, K.A., Bardone-Cone, A.M., 2022. Social comparison, disordered eating, and body dissatisfaction among postpartum women. *Body Image* 42, 401–412. <https://doi.org/10.1016/j.bodyim.2022.07.011>
- van der Aar, L.P.E., Peeters, S., Crone, E.A., 2018. The development of self-views across adolescence: Investigating self-descriptions with and without social comparison using a novel experimental paradigm. *Cogn. Dev.* 48, 256–270. <https://doi.org/10.1016/j.cogdev.2018.10.001>
- Veses, A.M., Martínez-Gómez, D., Gómez-Martínez, S., Vicente-Rodriguez, G., Castillo, R., Ortega, F.B., González-Gross, M., Calle, M.E., Veiga, O.L., Marcos, A., 2014. Physical fitness, overweight and the risk of eating disorders in adolescents. The AVENA and AFINOS studies. *Pediatr. Obes.* 9, 1–9. <https://doi.org/10.1111/j.2047->

6310.2012.00138.x

Yao, L., Niu, G., Sun, X., 2021. Body image comparisons on social networking sites and Chinese female college students' restrained eating: The roles of body shame, body appreciation, and body mass index. *Sex Roles* 84, 465–476.

<https://doi.org/10.1007/s11199-020-01179-1>

Zimmer-Gembeck, M.J., Hawes, T., Pariz, J., 2021. A closer look at appearance and social media: Measuring activity, self-presentation, and social comparison and their associations with emotional adjustment. *Psychol. Pop. Media* 10, 74–86.

<https://doi.org/10.1037/ppm0000277>

Table 1

Scores, Effect Size of Differences, Composite Reliability (ρ) and Internal Consistency (α) Across Population Subgroups

	Gender											Eating disorders risk status										
	Girls (<i>n</i> = 318)					Boys (<i>n</i> = 371)						No (<i>n</i> = 524)					Yes (<i>n</i> = 165)					
	Range ^a	<i>M</i>	<i>SD</i>	α	ρ	Range ^a	<i>M</i>	<i>SD</i>	α	ρ	<i>d</i>	Range ^a	<i>M</i>	<i>SD</i>	α	ρ	Range ^a	<i>M</i>	<i>SD</i>	α	ρ	<i>d</i>
Age	12-19	14.97	2.09	-	-	12-19	15.15	1.98	-	-	0.09	12-19	15.03	2.01	-	-	12-19	15.16	2.12	-	-	0.06
Percentile-BMI	0-99.10	50.84	27.59	-	-	0.10-99.20	58.41	27.21	-	-	0.27	0-99.10	52.24	27.75	-	-	6.50-99.20	63.41	25.72	-	-	0.42
Self-esteem	1-7	4.92	1.81	-	-	1-7	5.31	1.62	-	-	0.23	1-7	5.22	1.66	-	-	1-7	4.85	1.89	-	-	-0.21
SPA	1-5	2.40	1.17	.92	.93	1-5	2.05	1.06	.93	.94	-0.33	1-5	1.93	0.94	.86	.92	1-5	3.11	1.19	.85	.93	1.09
Body comparison	1-7	3.02	1.77	.87	.88	1-7	2.55	1.57	.83	.84	-0.29	1-7	2.36	1.41	.82	.83	1-7	4.06	1.73	.82	.82	1.06
Eating comparison	1-7	2.23	1.59	.89	.90	1-7	2.21	1.49	.88	.88	-0.01	1-7	1.84	1.20	.89	.85	1-7	3.43	1.84	.84	.89	1.01
Exercise comparison	1-7	2.57	1.64	.86	.86	1-7	2.61	1.58	.85	.85	0.03	1-7	2.25	1.40	.86	.82	1-7	3.65	1.74	.82	.85	0.88
Depressive symptoms	0-4	1.05	1.03	.89	.89	0-3.83	0.75	0.91	.87	.89	-0.31	0-4	0.69	0.83	.88	.87	0-4	1.50	1.15	.87	.88	0.80

Note. BMI = Body mass index; *d* = Effect size of differences; SPA = Social physique anxiety.

^a Observed range in the case of Percentile-BMI and possible range for the remaining variables.

Table 2

Results of the Correlational Analysis

	1	2	3	4	5	6	7	8
1. Age	-	-.04 .08	-.07 -.18 ^a	.01 -.08	.10 ^a .05	.06 .10	.08 .09	.09 ^a -.10
2. Percentile-BMI	-.03 .01	-	-.11 ^a -.05	.05 .16 ^a	.01 .06	-.02 .02	.02 -.01	-.02 .08
3. Self-esteem	-.18 ^b -.04	-.11 ^a -.14 ^b	-	-.17 ^c -.30 ^c	-.13 ^b -.29 ^c	.02 -.21 ^b	.01 -.18 ^a	.15 ^b -.27 ^c
4. SPA	-.02 .03	.18 ^b .17 ^b	-.32 ^c -.10	-	.57 ^c .66 ^c	.34 ^c .46 ^c	.32 ^c .37 ^c	.33 ^c .43 ^c
5. Body comparison	.07 .13 ^a	.17 ^b .06	-.30 ^c -.06	.69 ^c .65 ^c	-	.59 ^c .65	.60 ^c .60 ^c	.33 ^c .47
6. Eating comparison	.04 .11 ^a	.16 ^b -.02	-.22 ^c .04	.57 ^c .46 ^c	.70 ^c .68 ^c	-	.65 ^c .69 ^c	.22 ^c .38 ^c
7. Exercise comparison	.05 .12 ^a	.16 ^b -.01	-.15 ^b -.01	.48 ^c .43 ^c	.68 ^c .65 ^c	.74 ^c .69 ^c	-	.23 ^c .43 ^c
8. Depressive symptoms	-.02 .12 ^a	.08 .11 ^a	-.33 ^c -.05	.47 ^c .44 ^c	.78 ^c .74 ^c	.44 ^c .35 ^c	.43 ^c .36 ^c	-

Note. Values for girls and boys (or participants not at risk and at risk for EDs) are presented below (above) the diagonal. BMI = Body mass index; SPA = Social physique anxiety.

^a $p < .05$, ^b $p < .01$, ^c $p < .001$.

Table 3

Results of the Regression Analysis Predicting Depressive Symptomatology

	β	<i>B</i>				
		<i>Est.</i>	<i>SE</i>	<i>t</i>	<i>p</i>	95% CI
Age	.006	.003	.016	0.173	.873	-.029 to .035
Percentile-BMI	-.009	.000	.001	-0.257	.792	-.002 to .002
Gender ^a	-.080	-.157	.065	-2.387	.018	-.286 to -.028
Self-esteem	-.098	-.056	.022	-2.938	.010	-.098 to -.012
Risk for EDs ^b	.123	.281	.096	3.256	.005	.093 to .468
SPA	.205	.179	.042	4.497	< .001	.094 to .363
Body comparison	.145	.085	.033	2.622	.012	.021 to .170
Eating comparison	.040	.025	.062	0.782	.490	-.047 to .099
Exercise comparison	.120	.073	.034	2.458	.037	.009 to .141

Note. BMI = Body mass index; EDs = Eating disorders; β = Standardized regression coefficient; *B* = Unstandardized regression coefficient; *SE* = Standardized error; CI = Confidence interval.

^a Reference group: Girls.

^b Reference group: Participants not at risk for EDs.

Table 4

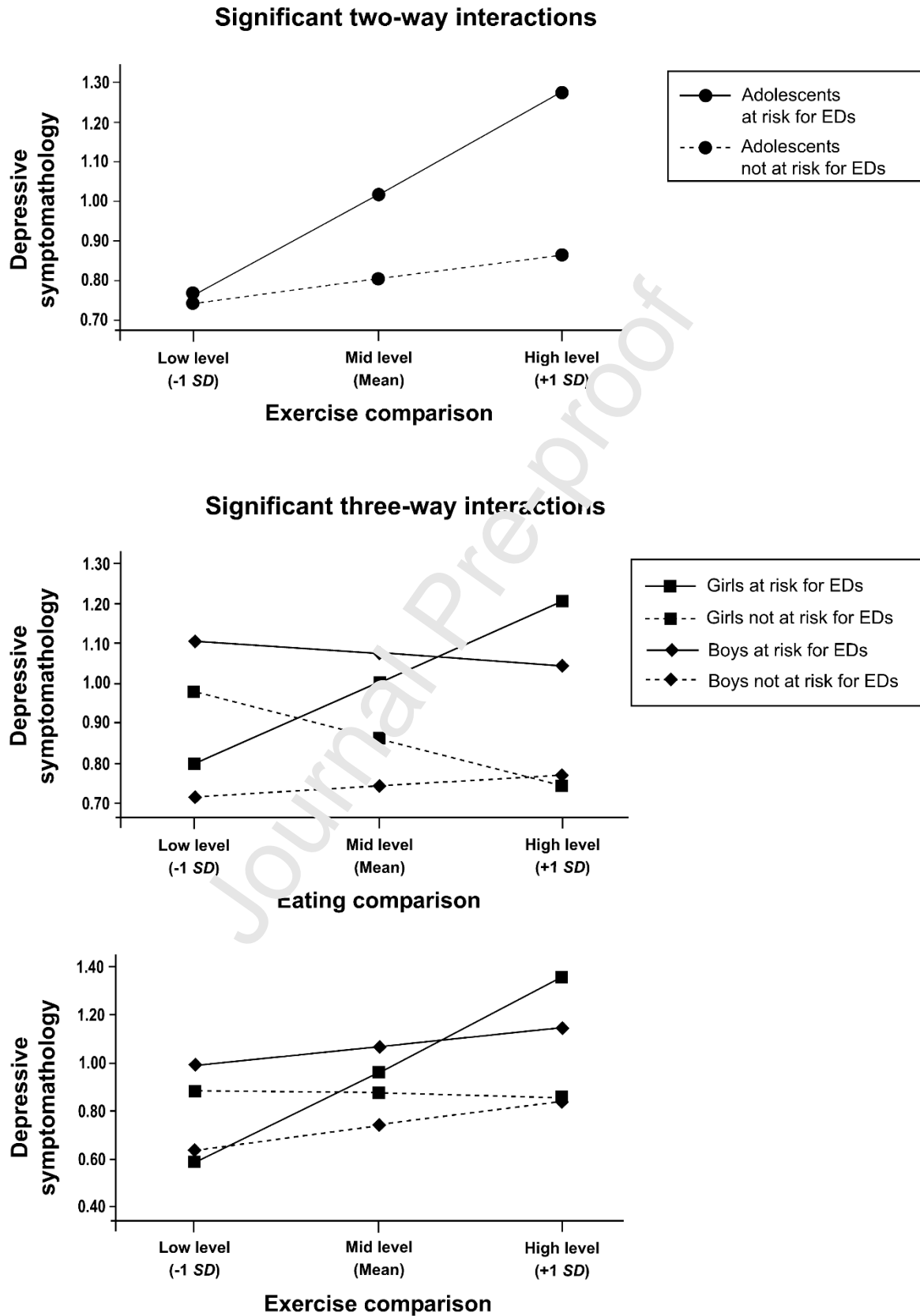
Conditional Effects of Social Comparison Forms on Depressive Symptomatology Across Population Subgroups

Comparison form	Subgroups		β	B					ΔR^2	p
	Gender	EDs risk status		Est.	SE	t	p	95% CI		
Body	Girls	-	.140	.085	.040	2.123	.034	.006 to .163	.000	.984
	Boys	-	.142	.086	.043	2.018	.044	.002 to .169		
Body	-	No	.105	.063	.035	1.823	.069	-.005 to .131	.004	.127
	-	Yes	.245	.148	.058	2.563	.011	.035 to .261		
Body	Girls	No	.067	.041	.044	0.913	.361	-.047 to .128	.004	.123
	Girls	Yes	.363	.219	.071	3.069	.002	.079 to .359		
	Boys	No	.149	.090	.045	2.012	.045	.002 to .178		
	Boys	Yes	.156	.094	.084	1.119	.263	-.071 to .260		
Eating	Girls	-	.051	.033	.045	0.740	.459	-.055 to .122	.000	.764
	Boys	-	.028	.019	.045	0.431	.667	-.066 to .103		
Eating	-	No	-.016	.010	.041	-0.248	.805	-.091 to .071	.003	.172
	-	Yes	.102	.067	.050	1.321	.187	-.032 to .165		
Eating	Girls	No	-.017	.076	.064	-1.184	.237	-.203 to .050	.007	.033
	Girls	Yes	.200	.130	.063	2.047	.041	.005 to .255		
	Boys	No	.029	.019	.047	0.398	.691	-.074 to .112		
	Boys	Yes	-.029	.019	.075	-0.249	.803	-.166 to .128		
Exercise	Girls	-	.140	.087	.045	1.946	.052	-.001 to .176	.000	.580
	Boys	-	.100	.062	.041	1.531	.126	-.018 to .142		
Exercise	-	No	.060	.037	.036	1.037	.300	-.033 to .108	.007	.035
	-	Yes	.255	.159	.058	2.720	.007	.044 to .273		
Exercise	Girls	No	.012	-.008	.047	-0.165	.869	-.100 to .084	.008	.023
	Girls	Yes	.384	.240	.068	3.549	>.001	.107 to .372		
	Boys	No	.097	.060	.043	1.394	.164	-.025 to .145		
	Boys	Yes	.079	.050	.086	0.576	.565	-.119 to .219		

Note. EDs = Eating disorders; β = Standardized regression coefficient; B = Unstandardized regression coefficient; SE = Standardized error; CI = Confidence interval.

Figure 1

Simple slope analyses for the significant two- and three-ways interactions



Contributors

MAI and AP designed the study, performed the systematic search and data extraction, completed all statistical analyses and initial drafts of the manuscript. MDG contributed to the drafting of the manuscript and revisions. All authors assisted with drafting of the final version of the manuscript, including critical revisions for intellectual content.

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Journal Pre-proof

Highlights

- Body comparisons account for unique variance in adolescent depressive symptoms
- Eating comparisons account for unique variance in adolescent females at risk for EDs
- Exercise comparisons account for unique variance in adolescent females at risk for EDs

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